

What is claimed is:

1. A system for conveying a well apparatus in a well, comprising:
 - a composite umbilical; and
 - a propulsion system attached downhole to said composite umbilical.
- 5 2. The system of claim 1 further including a fluid around said composite umbilical causing said composite umbilical to achieve substantially neutral buoyancy within the well.
3. The system of claim 1 wherein said composite umbilical includes a tube with an axial component of the modulus of elasticity having Young's modulus in the range of 500,000 to 10,500,000 psi.
- 10 4. The system of claim 1 wherein said composite umbilical includes a tube which is non-isotropic.
- 4 5. The system of claim 1 wherein said composite umbilical includes a tube having a modulus of elasticity which is not the same in all axes.
- 15 6. The system of claim 1 wherein said composite umbilical includes a tube having a modulus of elasticity which is not linear.
7. The system of claim 1 wherein said composite umbilical includes a tube having a material with a density in the range of from 0.99 grams per cubic centimeter to 2.9 grams per cubic centimeter.
8. The system of claim 1 wherein said composite umbilical includes a tubular member 20 having a portion made of non-metal.
9. The system of claim 1 wherein said composite umbilical is made of a substantially non-metallic material.

10. The system of claim 1 wherein said composite umbilical is made of a fiber reinforced matrix.

11. The system of claim 1 further including a metallic conductor embedded in a wall of said composite umbilical.

5 12. The system of claim 1 further including a data transmission conductor housed within a wall of said composite umbilical.

13. The system of claim 1 further including passages for conveying fluid pressure and conductors for conducting electricity and data.

14. The system of claim 1 wherein one or more sensors are housed within a wall of said 10 composite umbilical.

15. The system of claim 1 wherein said propulsion system includes an aperture therethrough extending from an upstream end to a downstream end for the flow of fluid through said propulsion system.

16. The system of claim 1 further including a bottom hole assembly with an automated feed 15 back system.

17. An apparatus for performing operations downhole in a well comprising:
a string of tubular members having a wall with non-metallic fibers; and
a bottom hole assembly attached downhole to said string.

18. The apparatus of claim 17 wherein said bottom hole assembly includes a well apparatus.

20 19. The apparatus of claim 17 wherein said bottom hole assembly includes a propulsion system.

20. The apparatus of claim 17 wherein said bottom hole assembly includes a three dimensional steering apparatus.

21. A drilling system for drilling into a formation comprising:
a string of pipe having a portion thereof which is non-metallic; and
a bottom hole assembly attached to one end of the string and having a propulsion system
and a member for displacing formation.

5 22. The system of claim 21 further including a connector for connecting lengths of said pipe.

23. The system of claim 21 further including a steerable assembly determining the direction
of the well path of said bottom hole assembly.

24. The system of claim 21 further including a power section providing power to said bottom
hole assembly.

10 25. The system of claim 21 wherein said pipe is a composite pipe.

26. A connector for connecting lengths of composite pipe for drilling a borehole comprising:
a first end connector mounted on one length of composite pipe;
a second end connector mounted on a second length of composite pipe;
said end connectors having mating cooperative slots and arcuate tapered surfaces which
engage upon rotating said end connectors.

15 27. A drill string for drilling a borehole comprising:
first and second lengths of a composite pipe, each length including an inner liner, a
plurality of load carrying layers around said liner, at least one electrical conductor and at least
one data transmission conductor extending said length between said load carrying layers;
20 first and second end connectors for disposition on said first and second lengths
respectively, said end connectors having apertures for receiving one end of said liners, load
carrying layers, electrical conductor and data transmission conductor;

10 said end connectors having conductor connectors for connecting said electrical conductors and said data transmission conductors; and

15 said end connectors having interengageable members connecting said end connectors.

20 28. A propulsion system for propelling a bit to drill a borehole comprising a housing with 5 traction modules for alternately engaging the borehole to propel the bit within the borehole.

25 29. A steerable assembly for steering a bit to drill a borehole comprising a housing, a plurality of spacer members disposed in apertures azimuthally spaced around said housing, and a plurality of actuators mounted in said housing for individually actuating said spacer members into engagement with the borehole at different radial extremes.

30 30. The assembly of claim 29 wherein said housing includes two housing sections having a flex joint therebetween and an output shaft extending through said housing with an articulated joint at said flex joint.

35 31. A bottom hole assembly for drilling a borehole in a formation comprising an electronics section and a propulsion system including a resistivity antenna, said resistivity antenna being connected to said electronics section for measuring the resistivity of the formation.

40 32. The assembly of claim 31 wherein said propulsion system includes a housing with an aperture receiving said resistivity antenna.

45 33. A system for drilling a borehole, comprising:

50 a string of composite pipe extending into the borehole;

55 a prime mover coupled to said pipe string;

60 a drill bit at one end for drilling the borehole;

65 said drill bit engaged to said prime mover;

70 a steerable assembly connected to said prime mover; and

10 said prime mover adapted to move said drill bit upstream or downstream within the borehole in response to said steerable assembly.

34. A bottom hole assembly for controlling the drilling of a borehole from a control at the surface, comprising:

5 a composite pipe extending into the borehole;

said pipe string having a data transmission conduit coupled to the control;

a prime mover coupled to said pipe;

10 a drill stem attached to an orientation assembly and to a drill bit at one end for drilling the borehole;

15 said drill stem engaging said prime mover and said orientation assembly coupled to said data transmission conduit;

20 a steerable assembly connected to said prime mover and coupled to said data transmission conduit;

25 said orientation assembly sending signals through said data transmission conduit to the control and said steerable assembly receiving signals from the control; and

30 said prime mover adapted to move said drill bit upstream or downstream within the borehole in response to said signals received by said steerable assembly.

35. A bottom hole assembly for use in drilling a borehole, comprising:

40 a pipe attached at one end to the bottom hole assembly and having a communication link extending through a wall of the pipe;

45 a downhole motor;

50 a drill bit;

55 a thruster;

an articulated joint disposed in said thruster and having a first portion connected to said downhole motor and a second portion coupled to said drill bit, said second portion connected to said first portion in a manner to permit said second portion to be bent from a coaxial orientation from said first portion; and

5 a steerable assembly in engagement with said second portion, said steerable assembly being in communication with said communication link to bend said second portion with respect to said first portion upon command to change the direction of said drill bit.

36. An apparatus for cutting an aperture in an existing cased borehole comprising:

an umbilical;

10 a bottom hole assembly attached to one end of said umbilical and including a housing having a traction module disposed on each end thereof and engaging the cased borehole;

a template reciprocably mounted within said housing, said template outlining the aperture to be cut in the cased borehole; and

15 a cutting member movably mounted on said housing for traveling along said template to cut the aperture to cut pieces of the cased borehole.

37. An apparatus for installing a joint of casing on a casing string extending into a well without a rig comprising:

an elevator attaching and aligning the joint of casing above the casing string;

tongs rotating and threading the joint of casing to the casing string;

20 a jack having slips for gripping the joint of casing; and

said jacks having hydraulic rams forcing the joint of casing and casing string into the well.